

Course Introduction



Cabrillo College

CIS 81 and CST 311

Rick Graziani

Cabrillo College and CSUMB

Fall 2007



Introduce yourselves...

Introductions

Rick Graziani (me 😊)

- **Main Web Page:**
 - <http://www.cabrillo.edu/~rgraziani>
- **Email:**
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Rick Graziani
Cabrillo College

Cabrillo College Computer Networking and System Administration Program Office Hours WebAdvisor Surfing

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Non-Cabrillo Instructors/Students: If you would like access to my materials please email me for the username and password.

CIS 81 Fundamentals of Computer Networking (CCNA 1)

This course discusses the fundamental of networking protocols and processes, building an in depth understanding and a foundation in these protocols. This course includes Ethernet, IP, subnetting, ARP, TCP/IP (including TCP, UDP, DNS, DHCP, ICMP), LANs, switching, wireless LANs, packet forwarding, encapsulation, and the interoperability between the protocols.

CIS 82 Routing Theory and Concepts (CCNA 2)

This course discusses the fundamental of routing protocols and packet forwarding. This course includes the concepts of static and dynamic route; along with the comparison of distance vector and link state routing protocols, classfull and classless routing protocols. Routing protocols and technologies are discussed including RIPv1, RIPv2, EIGRP, Single Area OSPF, VLSM and CIDR. Structure and lookup process of the IP routing table is also discussed.

CIS 83 Introduction to Switching and Wide Area Networks (CCNA 3 & 4)

Course Information – “Official description”

CIS 81 – Network Fundamentals (The “official description”.)

- ***Concepts, Terminology, OSI Model, IP Addressing, Subnetting, Ethernet, LANs, Protocols, Packets, Frames, Data Communications***
- This is the first course in the Cisco Networking Academy CCNA curriculum, and is a prerequisite for some of the MCSE/MCSA and SAIR Linux certification courses.
- It introduces networking standards, concepts, topology, media and terminology including LANs, WANs, the OSI model, cabling, IP addressing, subnetting, network hardware and various protocols.
- This course also provides additional information on networking theory and protocols beyond that of the basic Cisco Networking Academy Semester 1 course, leading to a more detailed understanding of networking.

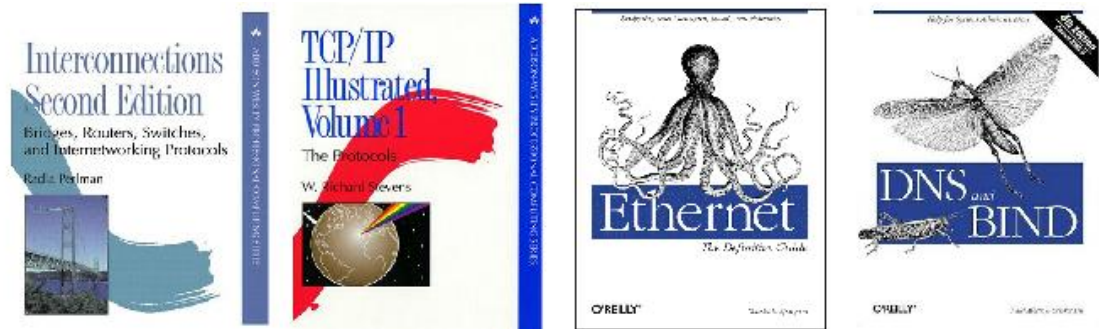
Course Information – “Official description”

- CST 311 ~ Intro Telecommunications
- Description: Survey of Telecommunication and Data communications technology fundamentals, Local Area Networks, Wide Area Networks, Internet and internetworking protocols including TCP/IP, network security and performance, emerging industry trends such as voice over the network and high speed networking. Designed as a foundation for students who wish to pursue more advanced telecommunications studies including certificate programs. Includes hands-on networking labs that incorporate Cisco CCNA module 1 as a lab component.

Course Information – My description

Cabrillo College

- Introduction to networking protocols.
- “Training is for a job, whereas education is for a career.”
- The focus of this class is **education** and to help the you develop a real **understanding** of networking, not merely memorizing facts and commands.
- We will focus on:
 - Protocols
 - Algorithms
 - Processes
- We include university level curriculum and textbooks from industry experts and authors such as Radia Perlman and W. Richard Stevens.



What about Certifications?

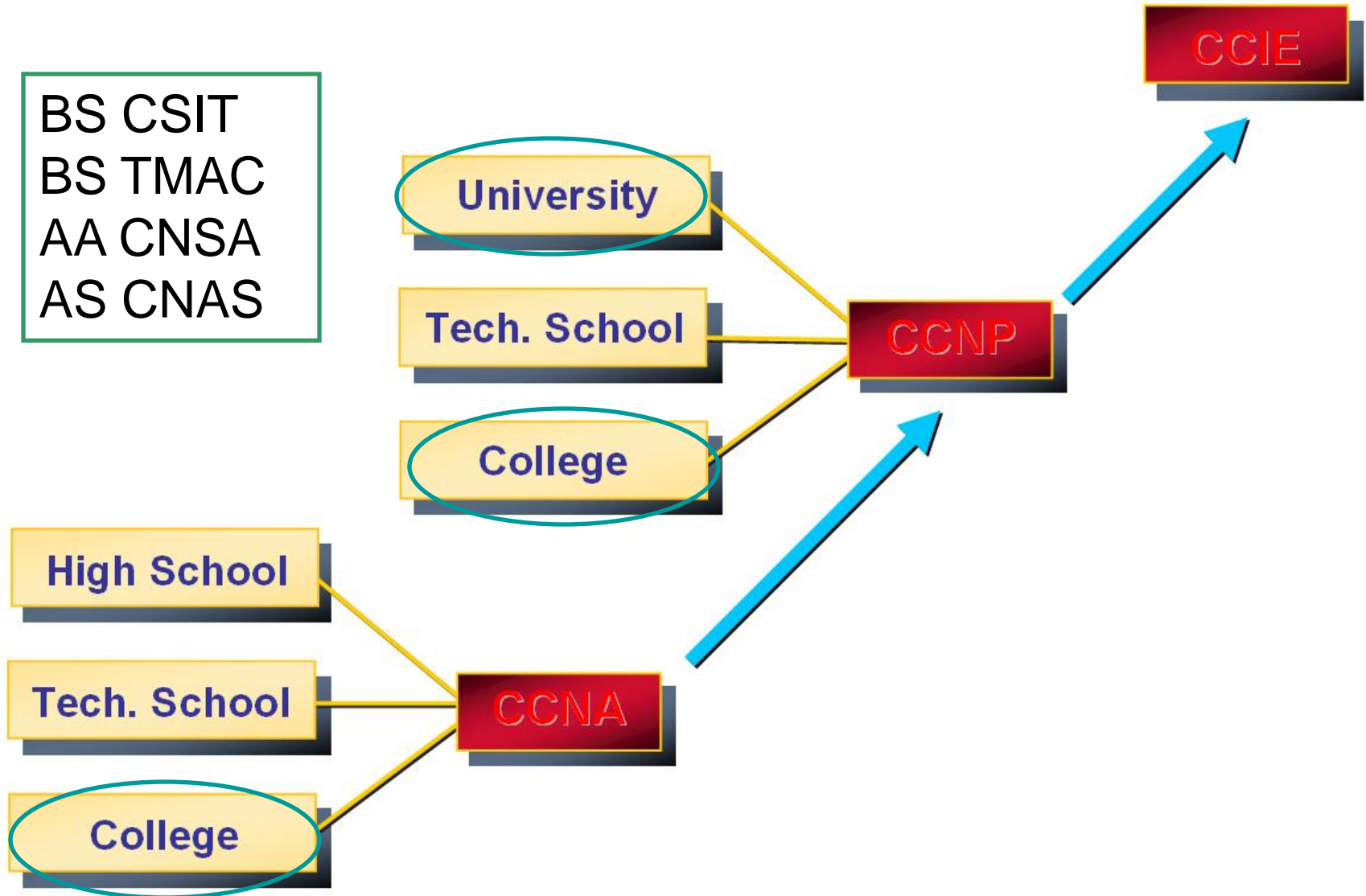
- I suggest that getting a four-year degree in networking should be a priority for “most” students.



- For those students interested in certifications, our goal is not only to help you obtain your CCNA, CCNP and other certifications, but to help you develop the knowledge and skills to live up to that certification title.
- We want to help develop networking professionals, CCNAs, CCNPs, etc., not just people who can pass the exams.


CCNA – CCNP – CCIE : AA – AS – BS

Cabrillo College



CCNA Curriculum

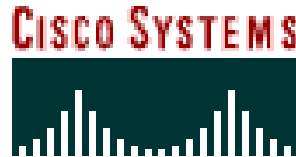
- Exploration: College/University Level
- Discovery: Introductory Level



**Cisco Networking Academy
OnLine Curriculum**

Cabrillo College	Computer Networking and System Administration Program	NetLab	Cisco Academy	WebCT
CCNA Exploration OnLine Curriculum		CCNP OnLine Curriculum		
CIS 81 Networking Fundamentals CCNA Network Fundamentals v 4.0		CIS 185 Advanced Routing CCNP 1 BSCI version 5.0		
CIS 82 Routing Protocols, Concepts, and Theory CCNA Routing Concepts and Protocols v 4.0		CIS 186 Implementing Secure Cisco Wide Area Networks CCNP 2 ISCW version 5.0		
CIS 83 LANs, Switching, and WANS CCNA 3 version 3.1 CCNA 4 version 3.1		CIS 187 Multilayer Switched Networks CCNP 3 BCMSN version 5.0		
		CIS 188 Optimizing Network Technologies (ONT or OCN) CCNP 4 ONT (OCN) version 5.0		
CCNA Discovery OnLine Curriculum (Introductory Level Curriculum - Not used in CNSA courses)				
CCNA 1 version 4.0 CCNA 2 version 4.0				

What about Cisco Systems?



- **Question:** Does this and some of the other courses focus only on Cisco Systems networking? Does it apply to using non-Cisco equipment?
- **Answer:** All of the information in CIS 81 (CST 311) and more than 95% of the courses that use Cisco equipment applies to general networking knowledge.
 - Cisco, Nortel, Lucent, Alcatel, Foundry, Juniper, and others, all apply industry standards protocols from IETF, IEEE, and others.
 - Typing the commands on the equipment is very easy. Understanding what is happening; how to design, implement, and troubleshoot networks is the difficult part.

Watsonville Routing Table

Network	Exit Int.	Next Hop
172.16.0.0	S0	Connected
192.168.1.0	E0	Connected
Default	S0	172.16.10.2

ISP A Routing Table

Network	Exit Int.	Next Hop
10.44.0.0	S1	Connected
172.16.0.0	S0	Connected
10.10.0.0/16	S1	10.44.0.2
192.168.10.0	S0	172.16.10.1

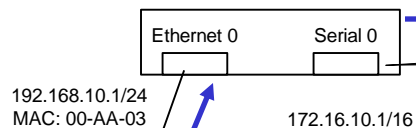
ISP B Routing Table

Network	Exit Int.	Next Hop
10.44.0.0	S0	Connected
172.30.0.0	S1	Connected
10.10.0.0/16	S1	172.30.1.2
192.168.10.0	S0	10.44.0.1

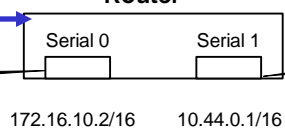
San Jose Routing Table

Network	Exit Int.	Next Hop
10.10.0.0/16	E0	Connected
172.30.0.0	S0	Connected
Default	S0	172.30.1.1

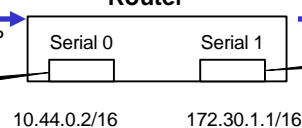
Watsonville Router



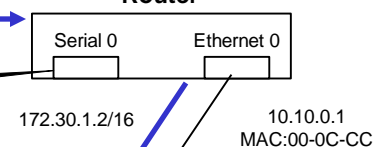
ISP A Router



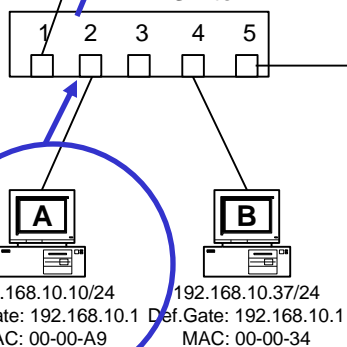
ISP B Router



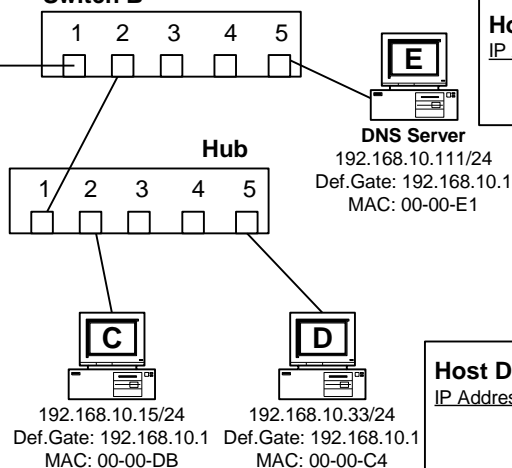
San Jose Router



Switch A



Switch B



Host E ARP Table

IP Address	MAC Address
------------	-------------

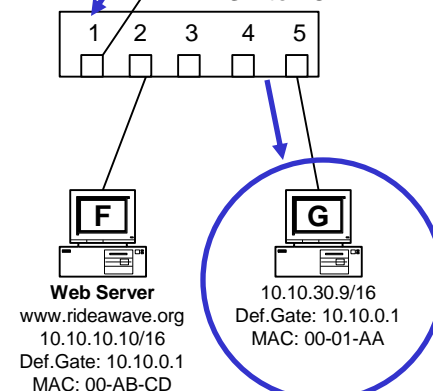
DNS Server

192.168.10.111/24
Def.Gate: 192.168.10.1
MAC: 00-00-E1

Host D ARP Table

IP Address	MAC Address
------------	-------------

Switch C



Host F ARP Table

IP Address	MAC Address
------------	-------------

Host A ARP Table

IP Address	MAC Address
------------	-------------

Switch A MAC Address Table

MAC Address	Source Port
-------------	-------------

Switch B MAC Address Table

MAC Address	Source Port
-------------	-------------

Watsonville Router ARP Table (E0)

IP Address	MAC Address
------------	-------------

San Jose Router ARP Table (E0)

IP Address	MAC Address
------------	-------------

Switch C MAC Address Table

MAC Address	Source Port
-------------	-------------

Watsonville Routing Table

Network	Exit Int.	Next Hop
172.16.0.0	S0	Connected
192.168.1.0	E0	Connected
Default	S0	172.16.10.2

ISP A Routing Table

Network	Exit Int.	Next Hop
10.44.0.0	S1	Connected
172.16.0.0	S0	Connected
10.10.0.0/16	S1	10.44.0.2
192.168.10.0	S0	172.16.10.1

ISP B Routing Table

Network	Exit Int.	Next Hop
10.44.0.0	S0	Connected
172.30.0.0	S1	Connected
10.10.0.0/16	S1	172.30.1.2
192.168.10.0	S0	10.44.0.1

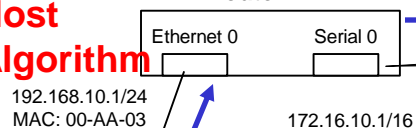
San Jose Routing Table

Network	Exit Int.	Next Hop
10.10.0.0/16	E0	Connected
172.30.0.0	S0	Connected
Default	S0	172.30.1.1

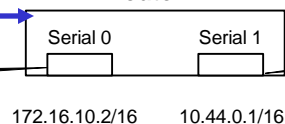
Introduction to Routing Protocols

**Default GW
or Local
Host
Algorithm**

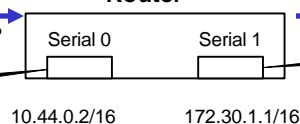
Watsonville Router



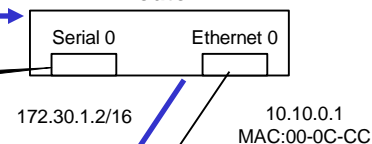
ISP A Router



ISP B Router



San Jose Router

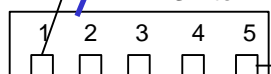


**Ethernet Switch Flood
or Filter Algorithm**

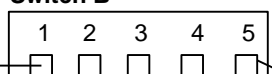
**IP Addressing and Subnetting
IP Protocol**

Ethernet Protocol

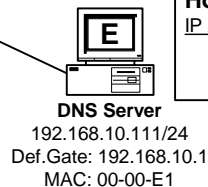
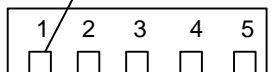
Switch A



Switch B



Hub



Host E ARP Table

IP Address	MAC Address
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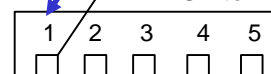
**DNS
ICMP
DHCP**

Host D ARP Table

IP Address	MAC Address
------------	-------------

TCP and UDP Protocols

Switch C



Web Server
www.rideawave.org
10.10.10.10/16
Def. Gate: 10.10.0.1
MAC: 00-AB-CD

Host F ARP Table

IP Address	MAC Address
------------	-------------

ARP Protocol and ARP Cache Process

Switch A MAC Address Table

MAC Address	Source Port
-------------	-------------

**Learning Bridge
Algorithm and
Table Operations**

Switch B MAC Address Table

MAC Address	Source Port
-------------	-------------

Watsonville Router ARP Table (E0)

IP Address	MAC Address
------------	-------------

San Jose Router ARP Table (E0)

IP Address	MAC Address
------------	-------------

Switch C MAC Address Table

MAC Address	Source Port
-------------	-------------

Course Information

Some of the fundamental networking topics covered:

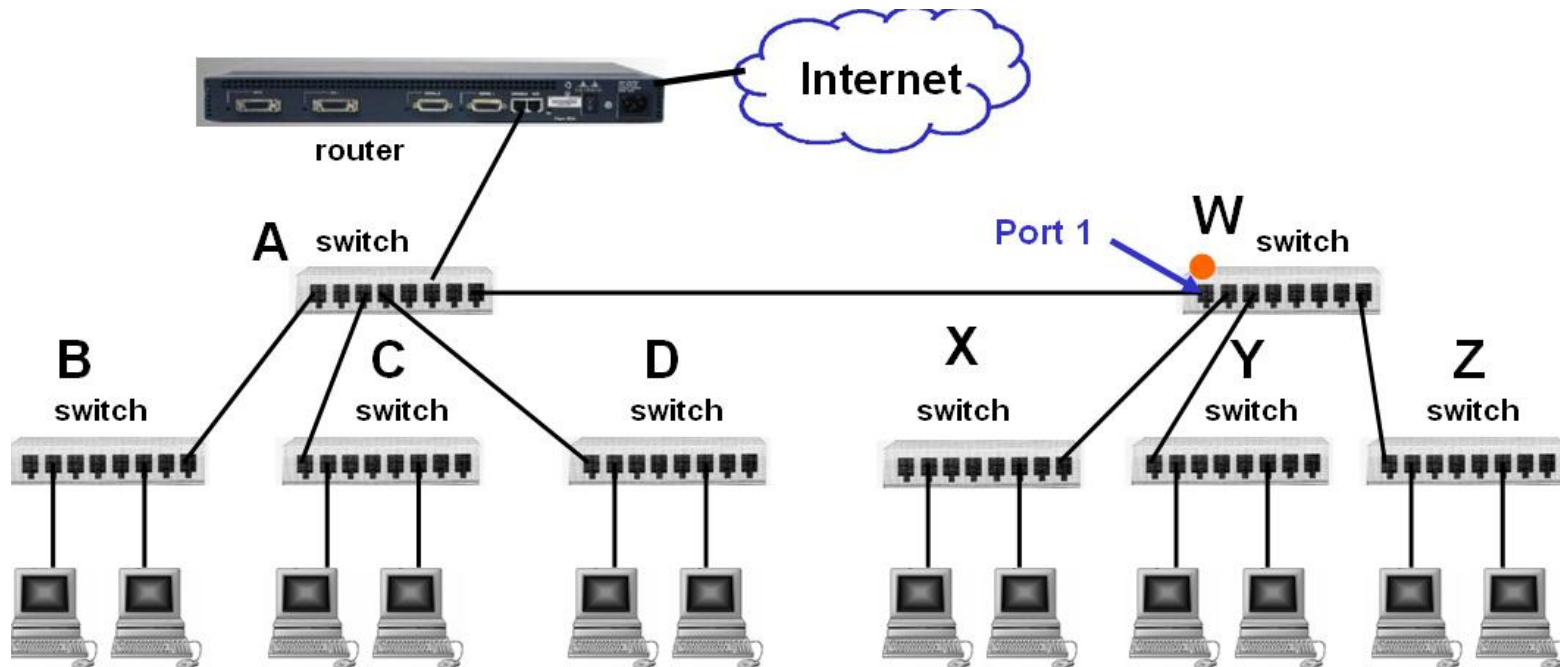
- Network Topologies
- Transmission media
- Coax, twisted pair, fiber
- Modulation
- NICs
- Hubs and Repeaters,
- Switches and Bridges
- ISO and the OSI Model
- Cabling, UTP
- Collisions domains
- Broadcast domains
- Binary and Hexadecimal number systems
- Ethernet frames
- MAC addresses
- Layer 2 communications
- IP Addressing and Subnetting
- Classful and Classless addressing
- Introduction to Routers and Routing Protocols
- ARP
- ICMP
- DHCP and DNS
- TCP and UDP

This will **not** be the last time you learn about these topics in your networking education and career.

Understanding not Memorizing

Example: Duplex mismatches on a switch

- Memorization: Two connected switches must be configured with the same duplex setting.
- Understanding: Understand the difference between full-duplex and half-duplex, along with Ethernet operations and slot time, TCP retransmission, and troubleshooting.
 - Understand why this is happening and why the switches' duplex settings must match.



Where am I?

- “What should I already know? I don’t know any of this.”
- Perfect, you are in the right class, but you should already have basic computer literacy knowledge and skills.
 - Hardware, software, CPU, RAM, ROM, disk drives, interface cards, bits, bytes, software development,
 - WWW, email, word processing, windows, file management
- “Rick, I think I already know most, if not all of this fundamental networking information. Do I still need to take the course?”
- See me after class and we can discuss your options.

My Approach

My approach:

- Simple minded (me)
- Repetition
- Documentation (PowerPoints, Reader, Books, Internet)
- Tools:
 - Etherereal Protocol Analyzer
 - Packet Tracer
- Don't expect you to know something I don't cover in class.
- Do expect you to be able to extend your knowledge on your own.
- Encourage courteous participation but will not force it.
- No surprise tests.

My background

Currently

- **Computer Science/Networking Instructor, Cabrillo College**
 - All CCNA and CCNP courses, Data Communications, Programming, Systems Analysis, etc.
- **Networking Consultant**
 - Network design, implementation, and troubleshooting.
 - Work for Cisco Systems in writing networking curriculum and various other projects.
 - Work for Cisco Press and other publishers as an author and technical reviewer.
 - Disclaimer...

Other Previous Work Experience

- Technical Training Manager/Instructor: Santa Cruz Operation (SCO)
- Systems Analyst: Tandem Computers
- Programmer/Analyst: Lockheed Corporation
- Programmer/Communications Officer: U.S. Coast Guard

Herding Cats

- In some ways, the hardest networking course you will ever take.
- Not because it is difficult, but because:
 - A lot of new concepts
 - These concepts become more clear in later courses, after you have seen them multiple times.
 - Learning networking is like trying to herd cats. No one great place to start.
 - The material this semester will make much more sense in later semesters. The more you learn about other areas, the more a certain topic makes sense.
 - A lot of, “You will learn more about that *later*.”
 - A lot of, “Good question, but there is no short answer right now.”
 - Sometimes, “See me after class and I can explain it.”

Subscribe!

- Cabrillo Networking Program Information
 - Subscribe to (no subject or body):
 - networkers-subscribe@cabrillo.edu
 - Program information
 - Certification information
 - Career and job information
 - Short-term classes, events, lectures, tours, etc.
 - Surveys
 - Networking info and links

Now, on to the web sites...

Cabrillo College

Rick Graziani
Cabrillo College

Cabrillo College

Computer
Admin

CIS 81 Fundamentals of Networking Rick Graziani, Instructor

Non-Cabrillo Instructors/Students

Home NetLab WebCT Online Curriculum

CIS 81 Fundamentals of Networking

CIS 81

This course discusses a foundation in the DHCP, ICMP, LAN protocols.

CIS 82 Routing and Switching

CIS 82

This course discusses static and dynamic classless routing Area OSPF, VLSM

CIS 83 Introduction to Ethernet

Introduction

PowerPoint Presentations
Course Introduction
Course Overview
Number Systems

Rick Graziani
Instructor, Computer
Email: graziani@cabrillo.edu

Non-Cabrillo Instructors/Students: If you would like access

Course Materials: CIS 81 Fundamentals of Networking

Ethernet (IEEE 802.3)

PowerPoint Presentations
Ethernet Fundamentals Part 1
Ethernet Fundamentals Part 2

Instructional
Software: Bird
Link: Firewall

Instructional
Ntshell: Hub
Ntshell: Ethernet

C:\CISCO_CCNA\Exploration1\theme\cheetah.html - Windows Internet Explorer

1 Living in a Network-Centric World

1.0 Chapter Introduction

CCNA Exploration
Network Fundamentals



1.0.1 Chapter Introduction

We now stand at a critical turning point in the use of technology to extend and empower our human network. The globalization of the [Internet](#) has succeeded faster than anyone could have imagined. The manner in which social, commercial, political and personal interactions occur is rapidly changing to keep up with the evolution of this global network. In the next stage of our development, innovators will use the Internet as a starting point for their efforts - creating new products and services specifically designed to take advantage of the [network](#) capabilities. As developers push the limits of what is possible, the capabilities of the interconnected networks that form the Internet will play an increasing role in the success of these projects.

This chapter introduces the platform of [data networks](#) upon which our social and business relationships increasingly depend. The material lays the groundwork for exploring the services, technologies, and issues encountered by network



1.0.1.1



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